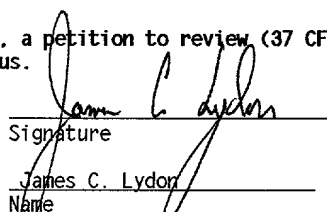


Form PTO-1390		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER BONN-069
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. 10/009824	
INTERNATIONAL APPLICATION NO. PCT/FR00/01719	INTERNATIONAL FILING DATE June 21, 2000	PRIORITY DATE CLAIMED June 22, 1999	
TITLE OF INVENTION: VALVES ENABLING A LIQUID TO BE DIRECTED IN A DIAGNOSTIC CHART, DIAGNOSTIC CHARTS AND DIAGNOSTIC DEVICE COMPRISING SEVERAL CHARTS		DATE: December 13, 2001	
APPLICANT(S) FOR DO/EO/US Bruno COLIN and Jacques DACHAUD			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
<ol style="list-style-type: none"> 1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). 4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ol style="list-style-type: none"> a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)). 7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <ol style="list-style-type: none"> a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input checked="" type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input checked="" type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). 			
Items 11. to 16. below concern other document(s) or information included:			
<ol style="list-style-type: none"> 11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 14. <input type="checkbox"/> A substitute specification. 15. <input type="checkbox"/> A change of power of attorney and/or address letter. 16. <input checked="" type="checkbox"/> Other items or information: <ol style="list-style-type: none"> a. WO 00/78453 (first page only) b. International Search Report (PCT/ISA/210) c. Written Opinion (PCT/IPEA/408) d. International Preliminary Examination Report (PCT/IPEA/409) 			

U.S. Application No. 10/009824		International Application No. PCT/FR00/01719		Attorney's Docket No. BONN-069	
17. [XX] The following fees are submitted:				CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO. \$890.00 International preliminary examination fee paid to USPTO (37 CFR 1.482). . \$710.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$740.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$ 1040.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4). \$ 100.00				890.00	
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$ 890.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	16 - 20	0	x \$ 18.00	\$	
Indep. claims	1 - 3	0	x \$ 84.00	\$	
Multiple dependent claim(s) (if applicable)			+ \$280.00	\$	
TOTAL OF ABOVE CALCULATIONS =				\$ 890.00	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				\$	
SUB TOTAL =				\$ 890.00	
Processing fee \$130.00 for furnishing the English translation later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$ 890.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$ 40.00	
TOTAL FEES ENCLOSED =				\$ 930.00	
				Amount to be: refunded	\$
				charged	\$
<p>a. [XX] A Credit Card Payment Form in the amount of <u>\$ 930.00</u> to cover the above fee is attached.</p> <p>b. [] Please charge my Deposit Account No. <u>50-1258</u> in the amount of \$_____ to cover the above fees. Two copies of this sheet are enclosed.</p> <p>c. [XX] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>50-1258</u>. Two copies of this sheet are enclosed.</p> <p>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to review (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</p>					
SEND ALL CORRESPONDENCE TO: James C. Lydon 100 Daingerfield Road Suite 100 Alexandria, Virginia 22314				Signature  Name James C. Lydon Registration Number 30,082 Date December 13, 2001	

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:

Bruno COLIN et al.

Serial Number: New Patent Application

Filed: December 13, 2001

For: VALVES ENABLING A LIQUID TO BE DIRECTED IN A DIAGNOSTIC CHART,
DIAGNOSTIC CHARTS AND DIAGNOSTIC DEVICE COMPRISING SEVERAL
CHARTS

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

December 13, 2001

Please amend this application, prior to calculation of the
filing fee, as follows:

IN THE SPECIFICATION:

Page 1, between the title and the first heading, please insert
the following:

This application is a U.S. National Stage of International
application PCT/FR00/01719, filed June 21, 2000 and published on
December 28, 2000 in the French Language, and which claims priority
of French Patent Application 99/08116, filed June 22, 1999.

IN THE CLAIMS:

Please cancel claims 1-18 without prejudice or disclaimer.

Please add new claims 19-34 as follows:

19. (New) A valve, crossed by at least one channel, allowing to direct at least one fluid displaced by transfer means within a test sample card, the card featuring two faces connected to one another by an edge, wherein it comprises a flexible film, and/or which can be distorted, part of which is fixed to at least one of the faces of said card, and a film compression means, which may be activated or deactivated, and wherein the securing is made on at least one of the faces, for example a plane face, by means of a securing feature located at the level of a recess provided around the valve, such as a groove.

20. (New) The valve of claim 19, wherein the securing of the film on the card is peripheral to the set of channels concerned by the valve, namely at least one fluid entry channel and at least one fluid exit channel, whether the fluids are identical or different.

21. (New) The valve of claim 19, wherein the securing is ensured by a heat seal peripheral to the valve.

22. (New) The valve of claim 19, wherein the compression means acts on the film at the intersection point between at least one of the channels of the valve and the face concerned of the card.

23. (New) The valve of claim 19, wherein the compression means comprises a flexible tab.

24. (New) The valve of claim 19, wherein the compression means features a closing means, such as an elastomer pin, and an opening and closing means, such as a wedge, which synergizes with the actuation mechanisms.

25. (New) The valve of claim 19, wherein the film on the valve is in contact with the plane face of the card, when said valve is in closed position, and is lifted in relation to said plane face, when the valve is in open position.

26. (New) A test sample card comprising at least two, and preferably a plurality of, valves of claim 19, which are positioned side by side and are fully or partly distributed along at least one edge of said card, and provided with compression means dedicated to the compression of the valves, positioned side by side, which are preferably connected together in order to form a strip assembly.

27. (New) The card of claim 26, having a substantially parallelepiped arrangement, wherein the edge(s) where the valves are located, is(are) rectilinear, and in that the distance

separating said edge in relation to the location of each valve is constant.

28. (New) The valve of claim 26, wherein two adjacent valves positioned side by side are separated by a space between 1 and 5mm, and preferably with spacing having values used in the field of electronics, such as 3.96mm, 2.54mm or 1.28mm.

29. (New) A device enabling several cards (1) to be implemented according to claim 26, comprising

- a storage area for the cards which are placed parallel to one another, with all of the valves on the same edge located within the same plane facing the intermediate area,
- a valve opening and closing inspection area associated with a manual or automatic control system, and made up of actuators, such as electromagnets, for the which the longitudinal movements take place in the direction of said intermediate area, and
- said intermediate area which serves as an interface between the storage area and the inspection area, this intermediate area consisting in maneuvering pins having at least two positions, one position which allows the opening and the other allowing the closure of valves.

New National Stage Application
PRELIMINARY AMENDMENT

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30. (New) The device of claim 29, wherein it has one actuator per card, and wherein there is one maneuvering pin per valve.

31. (New) The device of claim 29, wherein the movement of the actuator is coaxial to the longitudinal axis of the maneuvering pin and the valve, which is activated or deactivated.

32. (New) The device of claim 29, wherein the set of actuators is mounted in the same plane and is mobile along an axis parallel to the plane formed by all of the edges of the cards having the valves which can be activated by these actuators.

33. (New) The device of claim 29, wherein the maneuvering pins have two possible positions, one allowing the opening and the other allowing the closure of the valves, each position being on each side of a confining element.

34. (New) The device of claim 33, wherein the confining element is mobile between two extreme positions, one where it prevents the pins from moving, and the other where the movement of said pins is possible.

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IN THE ABSTRACT:

Please replace the original abstract with the attached
Substitute Abstract.

New National Stage Application
PRELIMINARY AMENDMENT

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REMARKS

This Preliminary Amendment cancels claims 1-18, adds new claims 19-34, amends the specification and presents a new Abstract. The amendment to the specification inserts a reference to parent application PCT/FR00/01719 pursuant to 37 C.F.R. § 1.78. New claims 19-34 are based on the amended claims 1-16 attached to the International Preliminary Examination Report, and have been written to avoid multiple dependencies and drawing reference numerals, and by otherwise conforming the claims to U.S. practice. The Substitute Abstract is based on the PCT Abstract. A version with markings to show changes made is attached as an Appendix. Claims 19-34 are pending.

An Information Disclosure Statement and a Recordation Form Cover Sheet are attached.

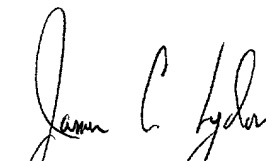
It is not believed that any fee is required for entry and consideration of this Preliminary Amendment. Nevertheless, the Commissioner is authorized to charge our Deposit Account No. 50-1258 in the amount of any such required fee.

New National Stage Application
PRELIMINARY AMENDMENT

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Prompt and favorable examination of the application are earnestly requested.

Respectfully submitted,



James C. Lydon
Reg. No. 30,082

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Enclosures:

Appendix
Abstract of the Disclosure
Information Disclosure Statement
Recordation Form Cover Sheet

New National Stage Application
PRELIMINARY AMENDMENT

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APPENDIX

Version With Markings to Show Changes Made

IN THE SPECIFICATION:

The paragraph inserted between the title and the first heading
on page 1 is new.

IN THE CLAIMS:

Claims 1-18 have been canceled.

Claims 19-34 are new.

IN THE ABSTRACT:

The Substitute Abstract is new.

ABSTRACT OF THE DISCLOSURE:

A valve (2), crossed by at least one channel (3), allowing to direct at least one fluid (F5) displaced by a transfer device within a test sample card (1), the card (1) featuring two faces (4 and 5) connected to one another (4) (5) by an edge (6). A card
5 equipped with a device allowing several cards equipped with such valves to be implemented is made up of a flexible film (7), and/or which can be distorted, part of which is fixed to at least one of the faces (4 and/or 5) of said card (1) on the one hand, and a film compression device (7), which can be deactivated on the other hand.
10 In addition, securing is carried out on at least one of the plane faces (4 and/or 5), for example, by a securing device located at the level of a recession (9) peripheral to the valve (2), such as a groove (9). The valve is particularly applicable in the field of
15 diagnosis.

4/pst

VALVES ENABLING A LIQUID TO BE DIRECTED IN A DIAGNOSTIC
CHART, DIAGNOSTIC CHARTS AND DIAGNOSTIC DEVICE COMPRISING
SEVERAL CHARTS

5

DESCRIPTION

10

This invention concerns the field of valves used to direct at least one fluid displaced by transfer systems within a test sample card. It also concerns a card equipped with a device allowing several cards equipped with such valves to be implemented.

15

Up until now, most test sample cards have recesses on both of their plane and parallel faces as well as crosswise recesses, all of the recesses forming a channel network in which one or more fluids are displaced. On the face of the cards, said recesses are marked out by adhesive films. Fluid displacement is controlled by valves.

20

This type of structure is not reusable, as a valve can only be used efficiently once. Thus, when the valve is tipped into closed position, the adhesive surface of the film also comes into contact with the rest of the card, and the valve can therefore no longer be used. The valve remains in closed position.

25

The only solution thus remaining is the deposit on an inert, that is non-adhesive film, of an adhesive layer having cut-outs which have been previously removed by a punch.

Technically speaking, this is not easy to achieve. Also, the cost of manufacturing such film in addition to the difficulties

encountered in positioning the film on the test sample card would be incompatible with mass production in large quantities.

5 The applicant filed a patent application on September 8, 1998, under application number FR98/11383. This invention concerns a device or test sample card enabling a reaction or at least two reactions to be conducted therein in parallel or in series. The device consists of a network of channels wherein the transfer of at least one sample to be treated and/or analyzed is possible, on the one hand, and at least one valve built into the device, on the other hand, enabling the orientation of each sample transferred at the network level and thus the control of transfers, reactions and analyses in said device. In the embodiment shown in figures 1 through 3, it can be seen that an elastomer disk is inserted between the adhesive film and the body of the card, which allows the valve to be reused.

This structure thus provides a solution, although it increases the number of elements and the manufacturing cost of a functional test sample card.

20 Document WO-A-97/27324 attempts to provide a solution to this problem. Thus, it concerns a cassette to conduct reactions in parallel which features an entry and exit orifice to transfer the sample(s) to be introduced into the cassette. Valves are present at cassette level, which have a particular construction (Bursapak

chamber, piston valve, bead valve). Under a continuous outside force, these valves allow a channel to be held closed. In this embodiment, the film is heat-sealed to the cassette.

However, this construction has a major disadvantage. The disadvantage resides in the deformation of the face of the cassette onto which the film is heat-sealed. While this face is originally plane, the heat-sealing weld causes distortion which is detrimental to subsequent proper use of the cassette. This could range from an error in manipulation and/or analysis to rendering the valves inoperable. The worst problems may be encountered when this type of cassette is used by an automated controller, which is generally the case. In this configuration, the card, which is warped by the heat-seal, may block or even damage the automated controller assembly.

Another disadvantage of this innovation is that it is absolutely necessary that the film is precisely heat-sealed onto the card. Even a tiny error may lead to channel blockage and/or valve leakage.

This invention provides a concrete response to all of the disadvantages of prior art. Thus, the film is heat-sealed onto the body of the test sample card without damaging the surface where the heat-seal is made. Furthermore, the tolerance for the heat-sealing

position is greater, as it only outlines the area that makes up the valve and does not follow it closely.

To this effect, this invention concerns a valve, with at least one channel running through it, allowing at least one fluid displaced by transfer means within the test sample card to be directed, the card featuring two faces connected one another by an edge, characterized in that it consists of a film, which is flexible and/or which can be deformed, secured partly on at least one of the faces of said card, and by a film compression means, which can be activated or deactivated, and in that their securing is made at least on one of the faces, for example a plane one, by a securing means located at the level of a recession surrounding the valve, such as a groove.

According to an alternative embodiment, the securing of the film on the card is peripheral to the set of channels concerned by the valve (i.e. at least one fluid entry channel and at least one fluid exit channel), both fluids may be identical or different.

According to another alternative embodiment, the securing is carried out by a heat seal peripheral to the valve.

According to still another alternative embodiment, the compression means acts on the film at the intersection between at least one of the valve channels and the face of the card in question.

According to yet another alternative embodiment, the compression means consists of a flexible tab.

According to yet another alternative embodiment, the compression means features a closure mechanism, such as an elastomer pin, and an opening or closing mechanism, such as a wedge, which synergizes with actuation mechanisms.

According to a preferred embodiment, at least two valves are positioned side by side, and the means assigned to compressing the valves, the latter being positioned side by side, are connected together to form a strip assembly.

Preferably, two adjacent valves positioned side by side are separated by spacing of between 1 and 5mm, and preferably with spacing having values used in the field of electronics, such as 3.96mm, 2.54mm or 1.28mm.

According to another preferential embodiment, the film near the valve is in contact with the plane face of the card when said valve is in closed position, and is elevated in relation to said plane face when the valve is in open position.

The invention also concerns a test sample card made up of a multiplicity of valves described above which are, fully or partly, distributed along at least one edge of said card.

When the card is in more or less parallelepiped arrangement, the edge(s), where the valves are located, is(are) rectilinear, and

the distance separating said edge is constant, in relation to the location of each valve.

The invention concerns a device enabling the implementation of several cards, described above. This device consists of the following:

- a storage area for the cards which are placed parallel to one another,
- a valve opening and closing inspection area associated with manual or automatic control, and
- an intermediate area used as an interface between the storage and inspection areas.

According to a preferential embodiment, the cards are arranged in the storage area with all valves on the same edge located within the same plane facing the intermediate area; the inspection area consists of actuators, such as electromagnets, whose longitudinal movements are made in the direction of said intermediate area, and this intermediate area consists of maneuvering pins having at least two positions, one position which allows valve opening and the other allowing valve closure.

According to another embodiment, the device features one actuator per card and one maneuvering pin per valve.

According to yet another embodiment, the actuator's movement is coaxial to the longitudinal axis of the maneuvering pin and valve, which is activated and deactivated.

According to yet another embodiment, all of the actuators are
5 installed in the same plane and are mobile along an axis parallel to the plane formed by all of the edges of the cards having valves which could be actuated by these actuators.

According to another embodiment, the maneuvering pins have two possible positions, one allowing the valves to be opened and the
10 other allowing the valves to be closed, each position being on each side of a confining element.

Preferably, the confining element is mobile between two extreme positions, one where it prevents any pin movement and the other where the movement of said pins is possible.

The accompanying drawings are given by way of example and are
15 not to be taken as in any way limiting. They are intended to make the invention easier to understand.

Figure 1 represents a perspective view of a test sample card according to a preferred embodiment of this invention.

20 Figure 2 represents a perspective view of the bottom of one of the flexible blades shown in figure 1.

Figure 3 shows a cross-sectional view through A-A in Figure 1.

Figure 4 represents a view of the top of the test sample card, with the tabs removed.

Figure 5 represents a cross-sectional view along B-B of figure 4, when the valve is in closed position.

5 Figure 6 represents a cross-sectional view identical to figure 5, when the valve is in open position.

Figure 7 represents a cross-sectional view identical to figure 3, although the tab has a different structure and operates in a manner opposite that of the previous figures.

10 Figure 8 represents a cross-sectional view, prior to assembly by heat-sealing, of a test sample card body and a flexible film according to background art.

15 Figure 9 represents a cross-sectional view, after assembly by heat-sealing, of a test sample card body and a flexible film according to background art.

Figure 10 represents a cross-sectional view, prior to assembly by heat-sealing, of a test sample card body and a flexible film according to this invention.

20 Figure 11 represents a cross-sectional view, after assembly by heat-sealing, of a test sample card body and a flexible film according to this invention.

Figure 12 represents a partial cross-sectional view of a device allowing several cards equipped with the valves described above to be implemented.

Finally, Figure 13 shows a cross-sectional view through C-C in Figure 12.

This invention concerns the problems of heat-sealing films onto a solid support such as the body of the test sample card. The background art is well represented in figures 8 and 9 where it can be seen that the card 20 consists essentially of two opposite faces, parallel to one another and perfectly flat. A film 21 is located in the vicinity of one of these faces, as is clearly shown in figure 8. After heat-sealing 22 has been performed, it can be clearly seen on figure 9 that the body 20 is distorted and also lead the film 21 to be distorted. In this manner, this distortion induces depressions and elevations on the surface of the body of the card 20 which are detrimental to further use of this card, and which can also cause weakening in certain spots of the film 21. The assembly may be damaged and possibly prevent the card from being used for future analyses.

The purpose of this invention is thus to eliminate the problem of heat-sealing films onto a support, such as a test sample card which is generally made of plastic material.

In figures 10 and 11, it can be seen that the body of said card 1 features a groove 9 or recession in a certain location which will receive therein part of the flexible film 7, said film 7 and the body of the card 1 being held together by a weld 10 located in the bottom of the groove 9. As a result, the heat-seal weld 10 does not distort the upper surface of the card 1 and thus presents no subsequent problem in using said card 1 and in performing analyses.

Figure 1 shows a general perspective view of an embodiment according to the invention. The valves are partially represented as will be discussed below. Thus in this figure, the flexible film 7 as well as all of the elements that make up the valve inside the body of the card 1 are not represented although they are actually present. Nevertheless, the elements which are represented are important. Firstly, a strip assembly 13 can be seen which is made up of several tabs 8 and is fixed to the card 1 by a securing means 23. These tabs 8 extend onto one of the sides of the strip assembly 13 more or less perpendicularly to this tab 13, with all of the tabs 8 being parallel to each other. In addition, the distance separating two adjacent tabs 8 is constant, in such a way that there is a space separating all of the adjacent tabs 8. Preferably, this distance is identical to the spacing used in electronic applications, in order to reduce the cost of

manufacturing blades 13 or to use actuators which already exist in the background art. Such spacing may be between 1 and 5mm, and more precisely is equal to 3.96mm, 2.54mm or 1.28mm.

At the level of said blade 13, there is direct contact between the body of the card 1, and of course between the film 7, not shown in this figure, and this blade 13. Toward the right-hand side of the figure, an oblique face can be seen then a face parallel to the upper surface of the card 1 and finally another oblique face, both oblique faces forming an angle of more or less 90° between them, although this value is in no way limiting. At the bottom of the second oblique face, there is another parallel face near the upper surface of the card 1. This face enables the channel 3, that is integral with the underlying valve 2, to be directly opened or closed. On the right-hand side of this face there is a last beveled face 12 designed to synergize with a piston-type actuator 14, located at the far right of this figure.

The head of the actuator 14 is cone shaped; this shape allows the head to engage between the beveled edge 12 of the opening means of the flexible tab 8 and the beveled surface 19 of the card 1. This beveled surface 19 is present between the first upper face 4 and the edge 6 of said card 1, with this card 1 also including a second lower face 5.

The face of the flexible tab 8, which allows closure, is equipped with a closing means 11 or an elastomer pin 11 whose function will be described later. This pin 11 and the opening means or beveled face 12 are clearly shown in figure 2.

5 In both figures 1 and 3, it can be seen that the whole set of actuators 14 is mounted on a support 16, while each actuator 14 is supplied with compressed air in the direction of F1 or F2 by means of compressed air hoses 15.

10 In figure 3 and in combination with figure 1, it is easier to understand how this device works. When compressed air enters the hose 15, the piston 14 is displaced in the direction of F3 and the tab 8 is pushed in the direction of F4. When, conversely, the compressed air leaves the system in the direction of F2, the movements of the piston 14 and the tab 8 are reversed in relation
15 to arrows F3 and F4 in figure 3.

In figure 3 it can be seen that valve 2 is closed when the closing means or elastomer pin 11 compresses the intersection point of a channel 3 with the surface of the test sample card 1 where the film 7 is located.

20 Figure 4 represents a top view of figure 1 in the case where all of the flexible tabs 8 have been removed. In this case, it can be seen that each valve 2 is made up of a small plane surface on the same level as the rest of the plane surface of said card 1

(also see figures 5 and 6), this small surface including at least one inlet channel 3 and one outlet channel 3, the intersection point between this surface and the fluid input and output channels 3 being in contact with the film 7 as can be clearly seen in figure 5. In this case, the valve is closed. In figure 5, it can be seen that the elastomer pin 11 is schematically represented in order to clearly show that it blocks one of the two channels 3. Of course, the pin 11 may block either channel or both channels 3. Furthermore, the valve may have more channels, that is three or more.

It can also be seen that the card features a certain number of compartments 17. The compartments 17 are connected to the valves by means of channels 3. It is also possible, although not represented in the figure, that other valves and other compartments are located on the rest of the card 1 which allows mixing between two networks of channels 3 located in parallel and not in series. This is clearly represented in figure 4 where it can be seen that the movement of fluids in the direction of F6 on the card 1 may bring two liquids together for mixing or for analysis within a compartment 17.

In figures 5 and 6, it can now be seen that, on the upper valve 4 of card 1, there is a flexible film 7 which is not adhesive, as explained in the section dealing with background art.

This film 7 is thus heat-sealed in the peripheral groove 9 around the valve 2. Nevertheless, on the bottom face 5 of said card 1, an adhesive film 21, well known in prior art, can also be used. Of course, depending on the fact that valves 2 are located on one side or on both sides of card 1, it is also possible that a second flexible film 7 is present on this other side. The upper 4 and lower 5 faces are connected together by an edge 6 which features a chamfered surface 19 on at least one of the sides, as is shown in figures 1, 3 and 4 through 6.

The fluid or fluids in the test sample card 1 are displaced within this card 1 by means of a pressure or vacuum that is created. The movement of fluid in the direction of F5 in figure 6 is achieved by raising the pin 11 in the direction of F4, so that the flexible film can be distorted and the fluid can move in the direction of F5 as is clearly displayed.

According to a second embodiment of the invention, the role of said flexible tab 8 can be reversed. Thus, in figure 7, it can be seen that the flexible tab according to another embodiment features a closing means or wedge 18 at its free end which is opposite of that shown in other figures 1 through 3. It can be noted that the piston 14 does not act below the wedge 18 but on top of it, in such a manner that when said piston 14 is in position, as shown in figure 7, the valve is open. However, as soon as compressed air is

injected in the direction of F1, the actuator moves in the direction of F3 and the tab moves in the direction of F7, that is downward which closes the underlying valve.

A card 1 according to this invention thus has a more or less parallelepiped shape, preferably a rectangular parallelepiped. All of the edges 6 are thus linear and are thus capable of receiving valves 2 according to the invention, such as described above.

Preferably, at least one of the two long edges 6 only feature valves 2. In figure 13, only one edge 6 is partially represented as only four adjacent valves are represented.

Figure 12 represents the three essential areas which form the device. There are, inserted into the device, the inspection area 32 on the left, and the storage area 31 of the cards 1 on the right, and an intermediate area 33 which serves as an interface between the storage area 31 and the inspection area 32.

The storage area 31 consists of a storage drawer for example, not shown, featuring grooves designed to position each card 1 with constant spacing between the cards 1.

The inspection area 32 consists of a framework featuring two uprights or worm screws 27, which, by turning simultaneously, allow the movement of a mobile trolley 16 which supports all of the actuators or electromagnets 14. Each of these electromagnets 14

has a piston which can be moved longitudinally from the left to the right of figures 12 and 13 or vice versa.

The intermediate area 33 thus forms the link between areas 31 and 32 described above. The intermediate area 33 consists of the following:

a fixed guide plate 25 for the valve 2 maneuvering pins 24, the valves 2 being supported by the cards 1 located in the storage area 31, as a result of the application of the electromagnets 14 of the inspection area 32,

a programming grid or mobile counter plate 26 which allows the pins 24 to be held in their given position, and said maneuvering pins 24.

In figures 12 and 13, it can be seen that there are as many pins 24 as there are valves 2, although there is just one electromagnet 14 for the valves 2 of the same card 1. Of course, this is not limiting and it is possible to have several electromagnets 14 for the valves 2 of the same card 1.

Programming of the position of the valves, either open or closed, is thus performed by removing the counter plate 26 in order to disengage the previous positions of the pins 24, by activating the electromagnets 14 in order to place said pins 24 in either an "in" or "out" position in relation to said plate 26, and by replacing the counter plate 26 so that the position of the pins is

in relation with the open or closed valves that are desired. Tests have shown that only 100 milliseconds (ms) are required to program all of the valves 2 located in the same plane on the cards 1, by means of all the actuators 14. When there are ten (10) valves 2 per card 1 and ten (10) cards 1 are activated, 2.5 seconds are required to change the configuration of four hundred seventy (470) valves 1.

Each maneuvering pin 24 consists of an active part 29 and a shoulder 30 forming a stop, the assembly having a general "nail" shape. The active part 29 easily slides in the bore 34 provided in the plate 25, but also in the groove of the plate 26 designed to hold the shoulder 30 in position. However, said shoulder 30 is blocked between plate 25 and plate 26 when the pin 24 opens the valve 2, and is blocked only by plate 26 when said pin 24 closes said valve 2.

The plate 25 thus appears as a grid having as many bore holes 34 as there are pins 24. As for it, the plate 26 looks like a "comb".

If it is easy to understand the movement of the pins 24 from the retracted position to the extended position, with reference to figures 12 and 13, as only the deployment of the electromagnet is all that is needed, things would be different for the opposite movement. Thus, in order to shift from the extended position to

the retracted position, it is possible to magnetize the free end of the electromagnet which is in contact with said pin 24 or to insert a spring between the pin 24 and the counter plate 26 or any other means of prior art. It is also worth providing all means which
5 allow said pins 24 to be held in the bores 34.

The presence of O-rings 28 should also be noted between said plates 25 at the level of the bores 34, as well as the maneuvering pins 24.

REFERENCES

1. Test sample card
2. Valve
3. Channel
- 5 4 and 5. Faces of the card 1
6. Edge of the card 1
7. Flexible film and/or which can be distorted
8. Compression means of the film 7 or flexible tab
9. Recession or groove peripheral to the valve 2
- 10 10. Peripheral weld located in the bottom of the groove 9
11. Hermetic closure means or elastomer pin
12. Opening device or wedge
13. Strip assembly consisting of several tabs 8
14. Piston or programming electromagnet type actuator
- 15 15. Compressed air hose
16. Mobile trolley or support
17. Compartment of the card 1
18. Bevel or closing means
19. Beveled surface of the card 1
- 20 20. Body of the card according to prior art
21. Film according to prior art
22. Weld between the body of the card 20 and the film 21
23. Blade 13 securing means

- 24. Maneuvering pin
- 25. Fixed guide plate for pins 24
- 26. Mobile counter plate or programming grid
- 27. Worm screw
- 5 28. Ring seal
- 29. Active part of each pin 24
- 30. Shoulder forming a stop on each pin 24
- 31. Storage area
- 32. Inspection area
- 10 33. Intermediate area used as an interface between the storage area 31 and inspection area 32
- 34. Bore in the plate 25 designed to allow the pins 24 to slide
- 35. Groove in the plate 26 designed to hold the shoulder 30 in position
- 15 F1. Inlet of compressed air for actuating means 12
- F2. Outlet of compressed air for actuating means 12
- F3. Movement of actuating means 12
- F4. Tipping of the tab 8
- F5. Fluid transfer at the valve 2 level
- 20 F6. Fluid movements at the card 1 level
- F7. Tipping of the tab according to the embodiment of figure 7

AMENDED CLAIMS :**CLAIMS**

1. A valve (2), crossed by at least one channel (3), allowing to direct at least one
5 fluid (F5) displaced by transfer means within a test sample card (1), the card (1)
featuring two faces (4 and 5) connected to one another (4) (5) by an edge (6),
characterized in that it consists on the one hand of a flexible film (7), and/or which can
be distorted, part of which is fixed to at least one of the faces (4 and/or 5) of said card
(1), and on the other hand of a film (7) compression means (8), which may be activated
10 or deactivated, and in that the securing is made on at least one of the faces (4 and/or 5),
for example a plane face, by means of a securing feature located at the level of a recess
(9) provided around the valve (2), such as a groove (9).

2. The valve, according to claim 1, characterized in that the securing of the film
15 (7) on the card (1) is peripheral to the set of channels (3) concerned by the valve (2),
namely at least one fluid entry channel (3) and at least one fluid exit channel (3),
whether the fluids are identical or different.

3. The valve, according to any of claims 1 or 2, characterized in that the securing
20 is ensured by a heat seal (10) peripheral to the valve (2).

4. The valve, according to any of claims 1 through 3, characterized in that the
compression means (8) acts on the film (7) at the intersection point between at least
one of the channels (3) of the valve (2) and the face (4 or 5) concerned of the card (1).
25

5. The valve, according to any of claims 1 through 4, characterized in that the
compression means (8) consists of a flexible tab (8).

6. The valve, according to any of claims 1 through 5, characterized in that the
30 compression means (8) features a closing means (11), such as an elastomer pin (11),
and an opening and closing means, such as a wedge (12 or 18), which synergizes with
the actuation mechanisms (14).

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7. The valve, according to any of claims 1 through 6, characterized in that the film (7), on the valve (2), is in contact with the plane face (4 or 5) of the card (1), when said valve (2) is in closed position, and is lifted in relation to said plane face (4 or 5),
5 when the valve (2) is in open position.

8. The test sample card (1) made up of at least two, and preferably a plurality of, valves (2), according to any of claims 1 through 7, which are positioned side by side and are fully or partly distributed along at least one edge (6) of said card (1), and
10 provided with compression means (8) dedicated to the compression of the valves (2), positioned side by side, which are preferably connected together in order to form a strip assembly (13).

9. The card, according to claim 8, having a substantially parallelepiped arrangement, characterized in that the edge(s) (6), where the valves (2) are located, is(are) rectilinear, and in that the distance separating said edge (6) in relation to the location of each valve (2) is constant.
15

10. The valve, according to any of claims 8 or 9, characterized in that two adjacent valves (2) positioned side by side are separated by a space between 1 and 20 5mm, and preferably with spacing having values used in the field of electronics, such as 3.96mm, 2.54mm or 1.28mm.

11. The device enabling several cards (1) to be implemented according to any of
25 claims 8 or 10, characterized in that it consists of the following:

- a storage area (31) for the cards (1) which are placed parallel to one another, with all of the valves (2) on the same edge (6) located within the same plane facing the intermediate area (33),
- a valve (2) opening and closing inspection area (32) associated with a manual or
30 automatic control system, and made up of actuators (14), such as electromagnets, for the which the longitudinal movements take place in the direction of said intermediate area (33), and

- said intermediate area (33) which serves as an interface between the storage area (31) and the inspection area (32), this intermediate area (33) consisting in maneuvering pins (24) having at least two positions, one position which allows the opening and the other allowing the closure of valves (2).

5

12. The device, according to claim 11, characterized in that it has one actuator (14) per card (1), and in that there is one maneuvering pin (24) per valve (2).

10

13. The device, according to any of claims 11 or 12, characterized in that the movement of the actuator (14) is coaxial to the longitudinal axis of the maneuvering pin (24) and the valve (2), which is activated or deactivated.

15

14. The device, according to any of claims 11 through 13, characterized in that the set of actuators (14) is mounted in the same plane and is mobile along an axis parallel to the plane formed by all of the edges (6) of the cards (1) having the valves (2) which can be activated by these actuators (14).

20

15. The device, according to any of claims 11 through 14, characterized in that the maneuvering pins (24) have two possible positions, one allowing the opening and the other allowing the closure of the valves (2), each position being on each side of a confining element (26).

25

16. The device, according to claim 15, characterized in that the confining element (26) is mobile between two extreme positions, one where it prevents the pins (24) from moving, and the other where the movement of said pins (24) is possible.

Pat. No. 4286000

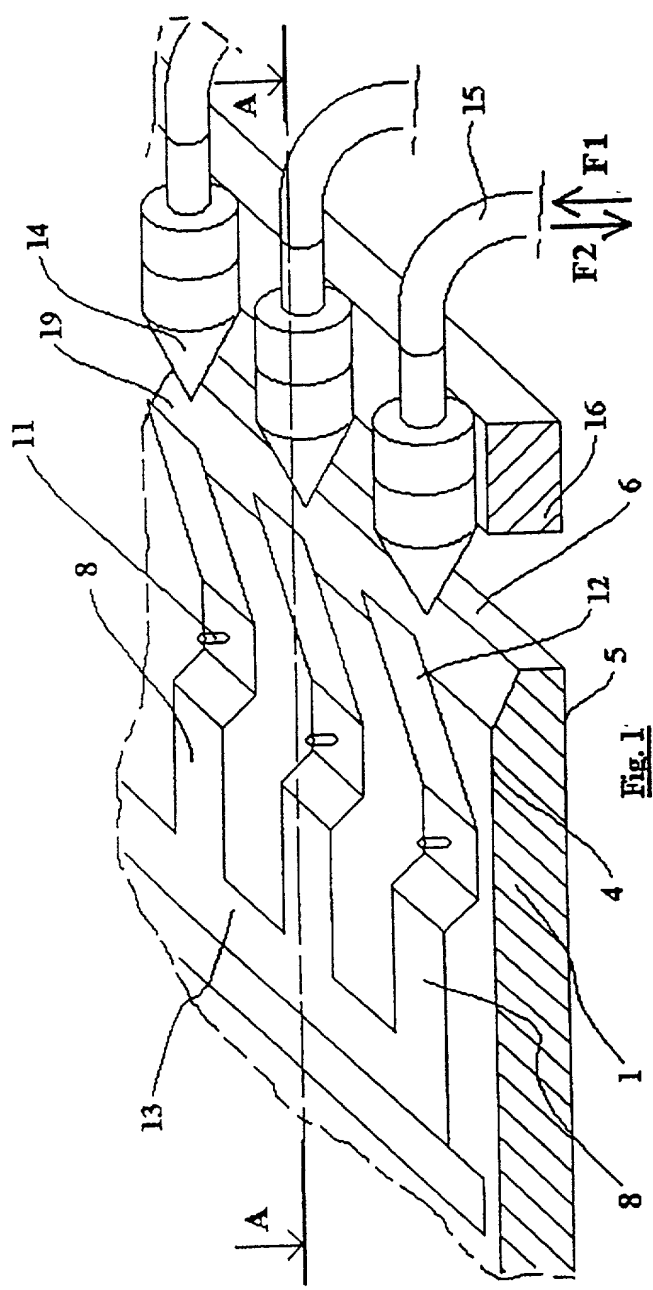
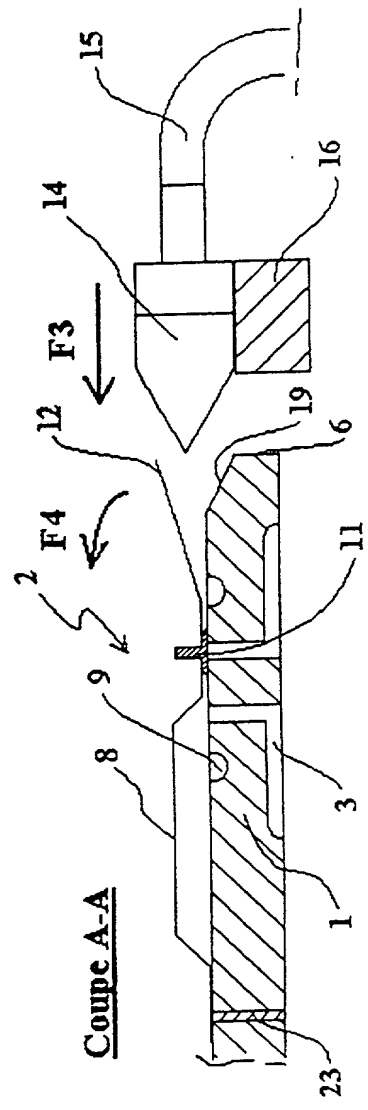


Fig. 1



Coupe A-A

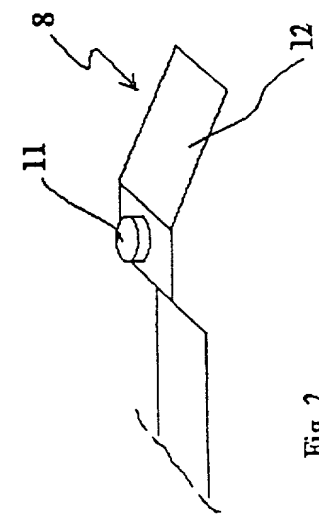
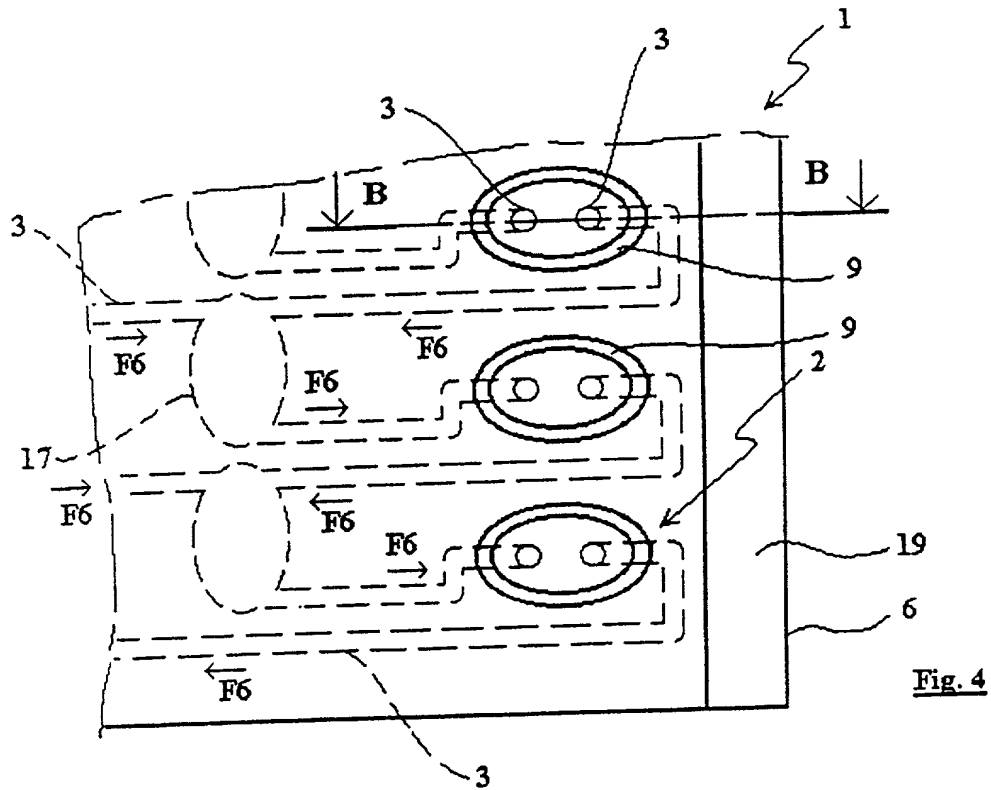
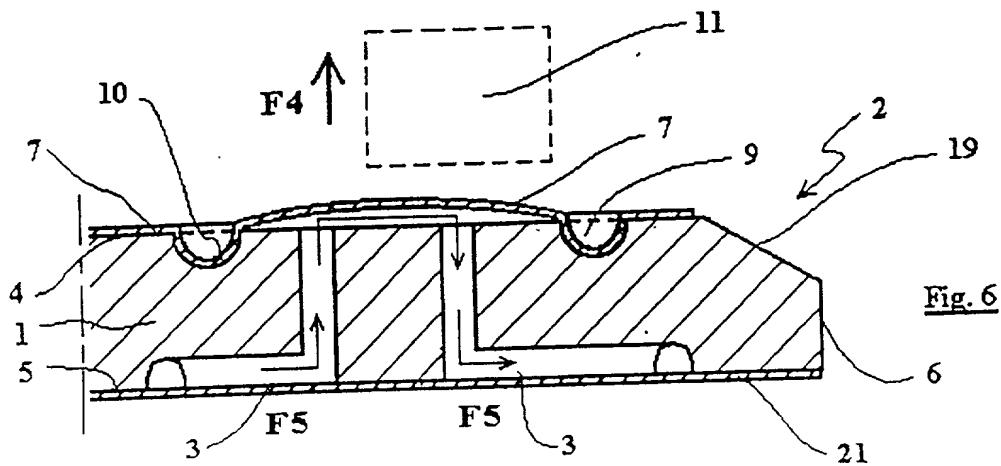
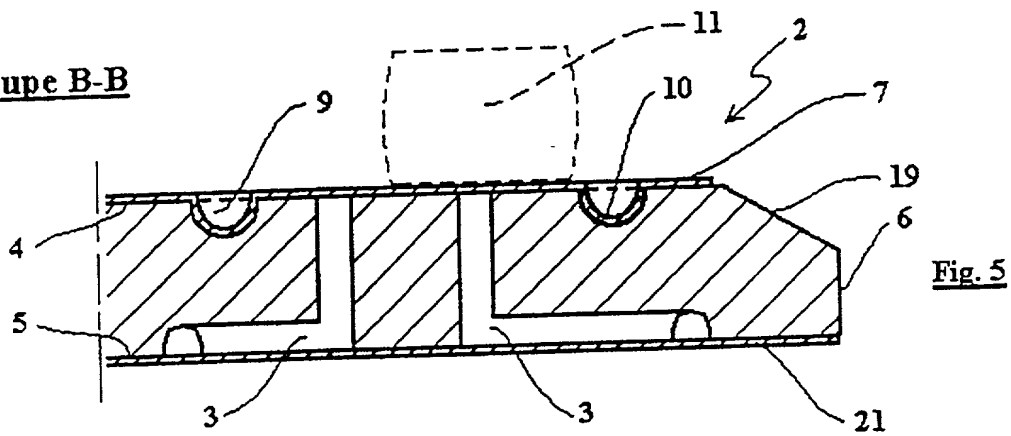


Fig. 2

Fig. 3



Coupe B-B



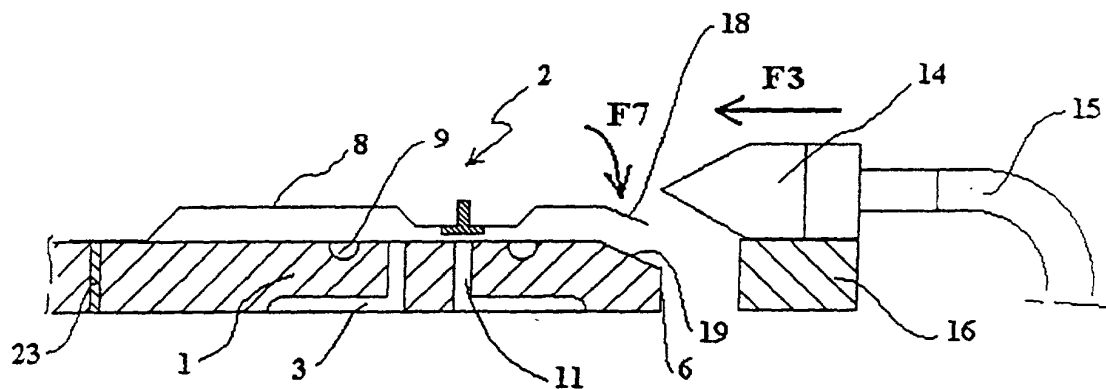


Fig. 7

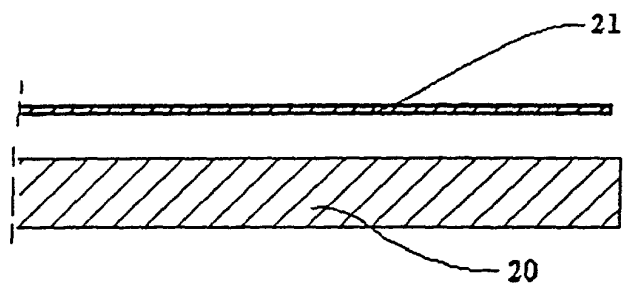


Fig. 8

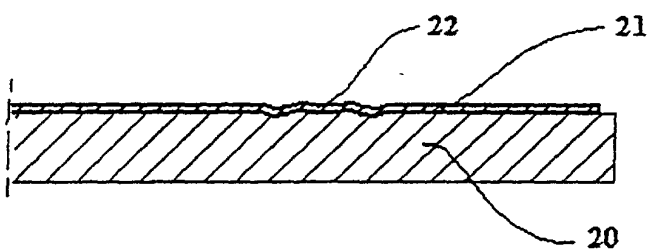


Fig. 9

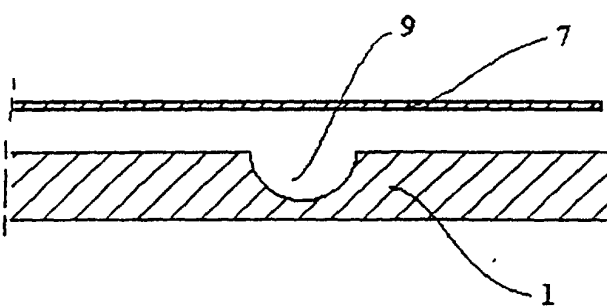


Fig. 10

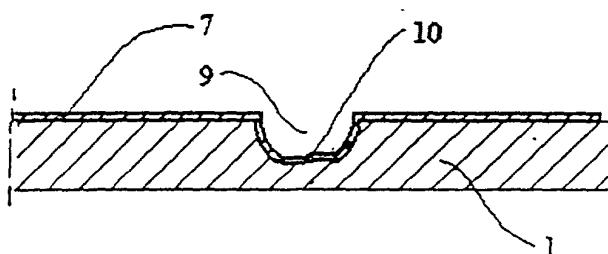
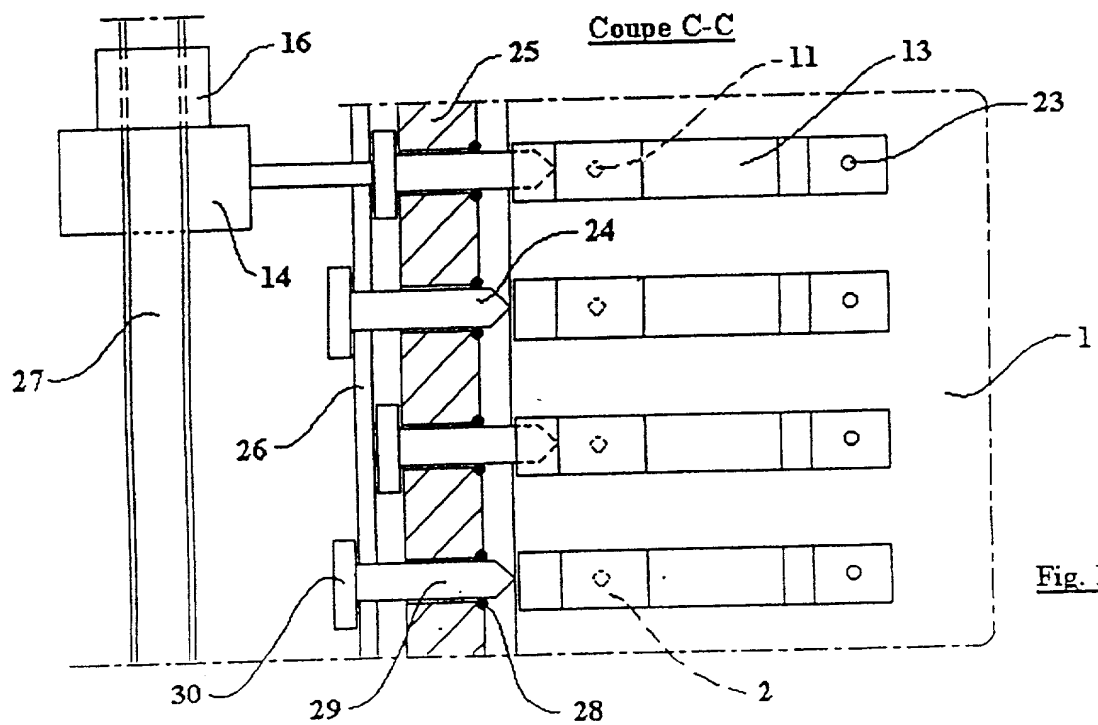
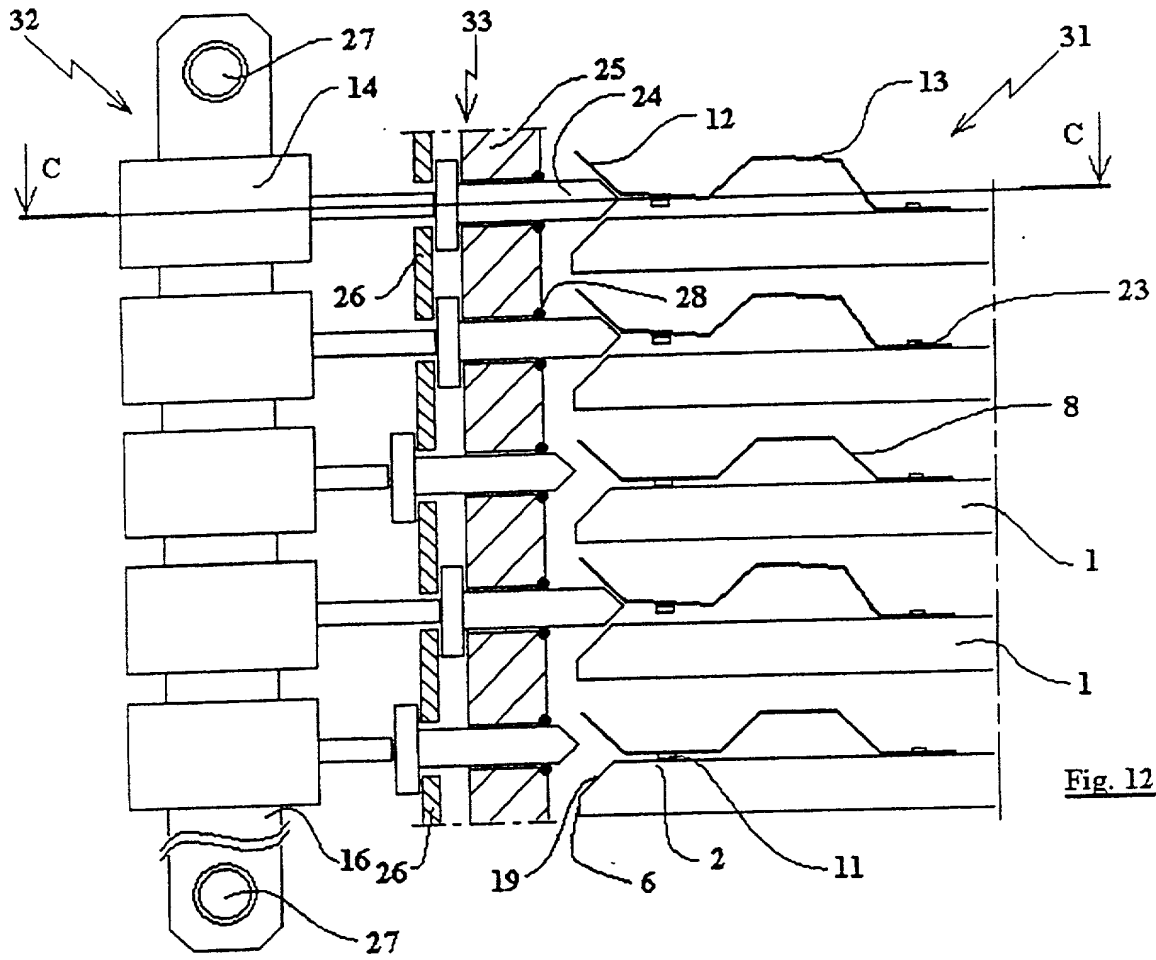


Fig. 11



Declaration For U.S. Patent Application

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled (INSERT TITLE) Valves enabling a liquid to be directed in a diagnostic chart, diagnostic charts and diagnostic device comprising several charts

the specification of which

(Check one of
1, 2, or 3.)

1. ☐ is attached hereto.
2. ☒ was filed on June 21, 2000 as
International PCT Application Serial No. PCT/FR00/01719
and was amended on August 29, 2001.
(if applicable)
3. ☐ was filed on _____ as
U.S. Application Serial No. _____
and was amended on _____.
(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application for which priority is claimed:

(List prior foreign applications.)	<u>99/08116</u>	<u>France</u>	<u>22 June 1999</u>	Priority Claimed
	(Number)	(Country)	(Day/Month/Year Filed)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	<u> </u>	<u> </u>	<u> </u>	<input type="checkbox"/> Yes <input type="checkbox"/> No
	(Number)	(Country)	(Day/Month/Year Filed)	
	<u>See attached list for additional prior foreign applications</u>			

I hereby claim the benefit under Title 35, United States Code, §120, of any United States application listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56, which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status)
(Application Serial No.)	(Filing Date)	(Status)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor's Signature: Date:

Residence:

Citizenship:

Post Office Address: